Tiberius® fs Laser for Life Science Imaging

TIBERIUS

Features

- Wide Tuning Range: 720 nm to 1060 nm
- Fast Tuning Speed: Up to 4000 nm/s
- High Output Power: >2.3 W at 800 nm
- Ultrafast 140 fs Pulses Help Minimize Pulse Broadening
- Long-Term Reliability for Exceptionally Low Cost of Ownership

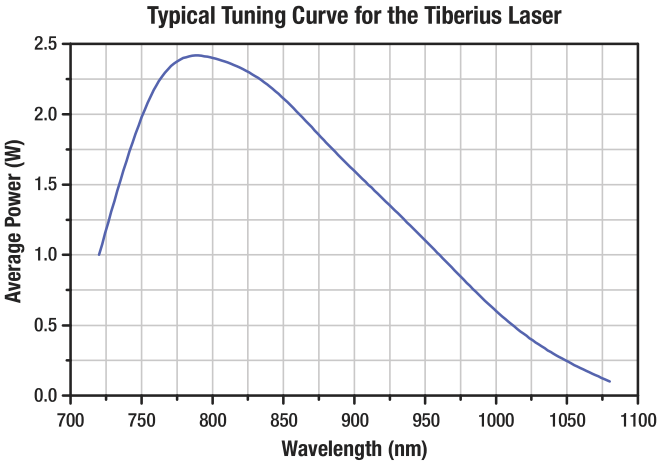
Applications

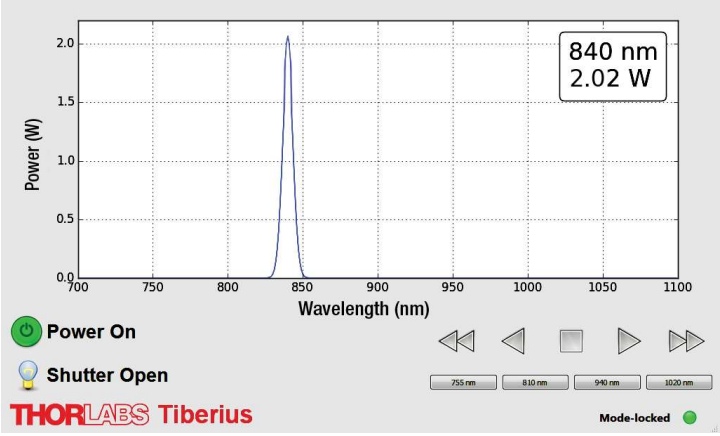
- Two-Photon Microscopy
- Photostimulation and Uncaging
- Label-Free Imaging via Multiphoton Autofluorescence and Second Harmonic Generation
- Fast Sequential Imaging

The Tiberius Femtosecond Tunable Ti:Sapphire Laser was designed in close collaboration with Thorlabs' life science application specialists. Manufactured in-house, it leverages the company's extensive expertise in optical design and precision manufacturing.

This multiphoton imaging laser offers an average power of >2.3 W at 800 nm and a center wavelength that is tunable from 720 nm to 1060 nm. This 340 nm wide tuning range allows the user to target specific compounds for multiphoton fluorescence imaging and photostimulation/uncaging.

The Tiberius laser emits pulses that are 140 fs in duration. The relatively narrow spectral bandwidth of these pulses was selected in order to reduce the pulse broadening caused by Pockels cells and other dispersive elements while still providing high peak intensity for two-photon excitation.





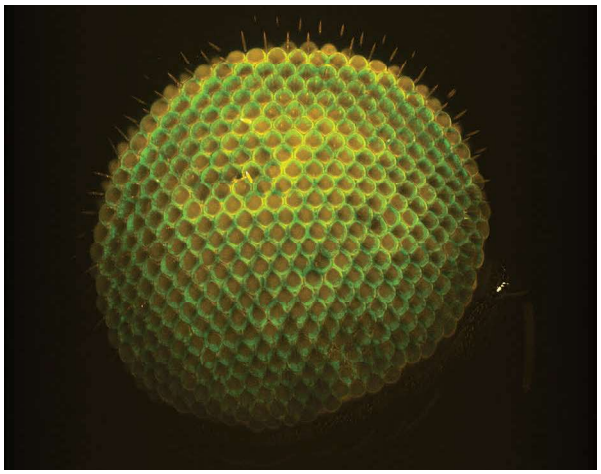
Tiberius Control GUI Provides Real-Time Spectral and Power Data

The Tiberius laser includes an intuitive GUI for control. Shown to the left, the GUI reports the center wavelength and output power of the laser, using the built-in spectrometer to provide real-time diagnostics of the spectral position and shape. User-programmable buttons provide single-click access to commonly used excitation wavelengths.

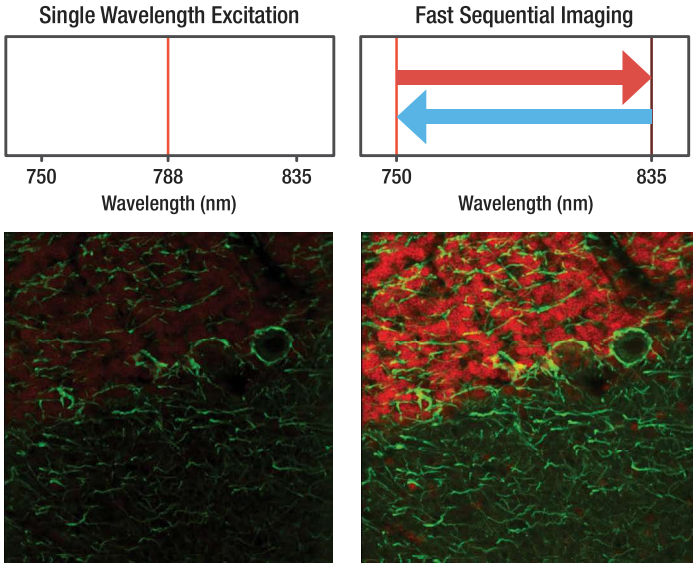
Designed for Two-Photon Imaging

Multiphoton microscopy takes advantage of the NIR transparency windows in living tissue and highly localized excitation to generate multi-channel fluorescence images of 3D volumes. Compared to visible light, which is used in conventional widefield microscopy and confocal microscopy, NIR light offers significantly reduced scatter and absorption by biological compounds, resulting in deeper images below the surface.

The image of a fruit fly eye to the right demonstrates the Tiberius' ability to resolve morphological features. This two-channel image contains GFP-labeled photoreceptors and unlabeled regions that exhibit multiphoton autofluorescence.



Fruit Fly Eye with GFP-Labeled Photoreceptors and Multiphoton Autofluorescence (Excitation Wavelength: 770 nm)



These images show two-photon excitation of a 25 µm thick adult rat brain sagittal section. The red channel corresponds to fluorescence from chick anti-neurofilament, while the green channel corresponds to fluorescence from mouse anti-GFAP. The left image shows excitation at 788 nm, which sub-optimally excites the two tags simultaneously. The right image is a composite of a two-color excitation imaging sequence at 7 fps using 750 nm and 835 nm, which excites both tags optimally and provides higher contrast.

Images Courtesy of Lynne Holtzclaw of the NICHD Microscopy and Imaging Core Facility, a Part of the National Institutes of Health (NIH) in Bethesda, MD

Fast Wavelength Tuning

With an industry-leading tuning speed of up to 4000 nm/s, the Tiberius is ideal for fast multi-color excitation imaging. For example, users can collect a sequence of two-channel fluorescence images by switching rapidly between the two optimum excitation wavelengths. This process, known as fast tuning, maximizes fluorescence at a lower excitation power that reduces the risk of photo bleaching. At full speed, both channels can be collected at an imaging rate of 7 fps with a resolution of 512 x 512 pixels.

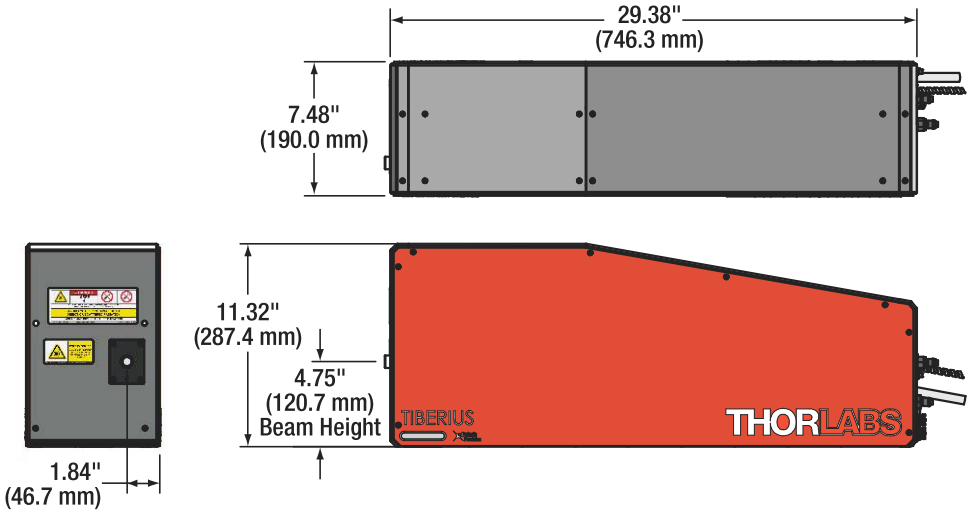
Fast tuning integrates seamlessly into our ThorImage®LS software, enabling synchronized control for photoactivation experiments and live high-speed imaging on millisecond timescales using the same laser.

Tiberius Laser with Rotating Bergamo II® Microscope (Optical Table Size: 4' x 6')

Tiberius® fs Laser Specifications

Specifications

Item #	TIBERIUS
Tuning Range	720 - 1060 nm
Pulse Width	140 fs
Average Output Power	>1.0 W at 720 nm, >2.3 W at 800 nm, >1.4 W at 920 nm, >0.5 W at 1000 nm, >0.3 W at 1040 nm
Repetition Rate	77 MHz (Nominal)
Noise	<0.15% (RMS, 10 Hz -1 MHz Measurement Bandwidth)
Beam Diameter ($1/e^2$)	1.5 mm (Nominal)
M^2	<1.2 at 800 nm
Pointing Stability During Tuning	<50 µrad per 100 nm
Electrical Specifications	
Input Voltage	100 - 240 V
Frequency	50 - 60 Hz
Power Consumption	1.2 kW (Max)
Environmental Requirements	
Room Temperature	17 - 25 °C
Room Temperature Stability	<3 °C over 24 Hours
Physical Dimensions	
Laser Dimensions	29.38" x 7.48" x 11.32" (746.3 mm x 190.0 mm x 287.4 mm)



Compact Footprint

Since tabletop space is often at a premium, the Tiberius laser has been designed with a vertical cavity that minimizes the footprint on the optical table. At 29.38" x 7.48", the Tiberius' footprint is about half that of competing designs, preserving valuable workspace for the rest of your experimental setup.